A Report on U.S., EN & IEC Standards Development on Bonding and Grounding Infrastructure for Telecommunications

Targeting Drafts TIA 607-C and ISO/IEC 30129

William Bush MBA; NCE
(wbush@ieee.org)
Industry Consultant
PQ, EMC, Lightning, Surge, Grd/Bond

ATIS PEG 2015 – Huntsville, AL

Main Points

- **TIA 607-B shopped and accepted into EN 50310 to develop draft IEC 30129**

- **TIA 607-B**

  Generic Telecommunications Bonding and Grounding (Earthing) for Customer Premises

IEC 30129

Telecommunications Bonding Networks for Buildings and Other Structures (??)

Main Points - 2

- IEC 30129 has two acceptable methodologies
  1) Resistance: based upon TIA 607-B
  2) Impedance: based upon EN 50130

- TIA 607-C draft intended to also meet IEC 30129 requirements

Main Points - 3

- Effectively, TIA 607 works (including the TIA/ATIS Joint Std TIA 607-A) are a basis for an Int'l standard IEC 30129
- ATIS did not rejoin TIA in the draft for TIA-607-B
- TIA 607-B developed by TIA cabling WG 42.16

Main Points - 4

- Very few of the SMEs from TIA-607 & 607-A participated in WG 42.16

- WG 42.16 heavily influenced by manufacturers and non-SMEs

- TIA 607-B developed with related information from NECA, BICSI and other TIA standards

Main Points - 5

- TIA 607-B further increases size of TBB
- TIA 607-B recommends bonding grid for computer rooms and a mesh-BN network
- TIA 607-C to add extra TBB parallel leads – claiming decreased HF impedance

Main Points – 6

- What has really happened??
  - More wires and increased wire size
  - Endorsement of bonding grid added to mesh-BN
    - For all installations
  - Increased claims to lower wiring impedance
  - Dependence on resistance testing alone for verification of wiring system
  - For IEC, dependence on added parallel wires to accomplish impedance control for HF
  - ATIS SME contributions compromised

The Relevant Standards

- TIA 942; NECA/BICSI 607; BICSI 002
  - Influencing standards on TIA 607-B
- TIA 607-B & addendum “Structural metal”
- ISO/IEC 30129 draft
  - EN 50310 and TIA 607-B harmonization
- TIA 607-C

Noted standards activity

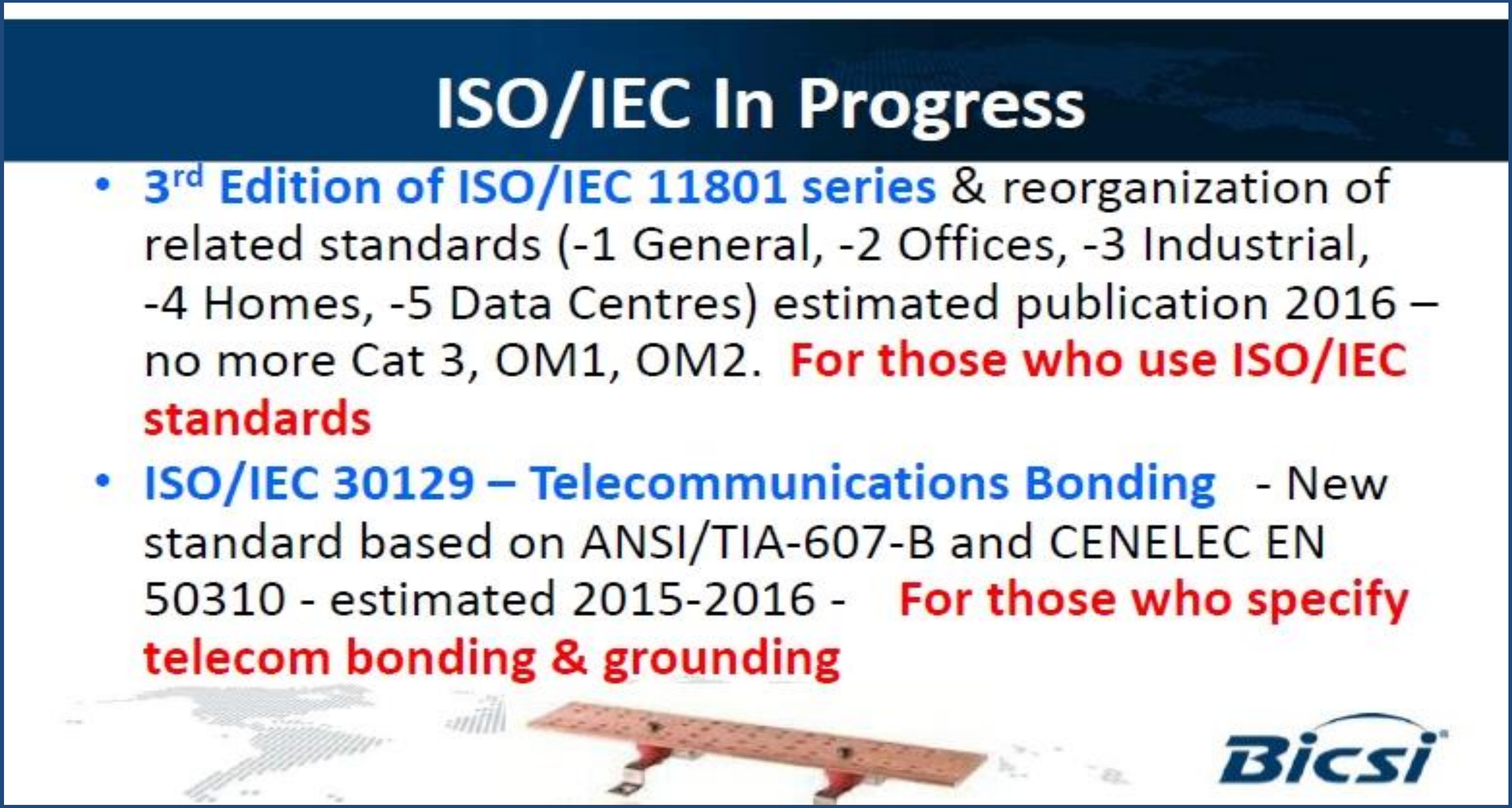
What BICSI, TIA & ISO/IEC are Doing With Standards and Why You Should Care

Jonathan Jew - J&M Consultants, Inc.

The organizations in this update

- **ISO/IEC** – ISO/IEC JTC 1 SC 25 WG 3 – international telecommunications cabling standards
- **TIA** (Telecommunications Industry Association) TR-42 – US and Canadian national telecommunications cabling standards
- **BICSI** – international standards and guidelines for information technology systems

Noted standards activity - 2



ISO/IEC In Progress

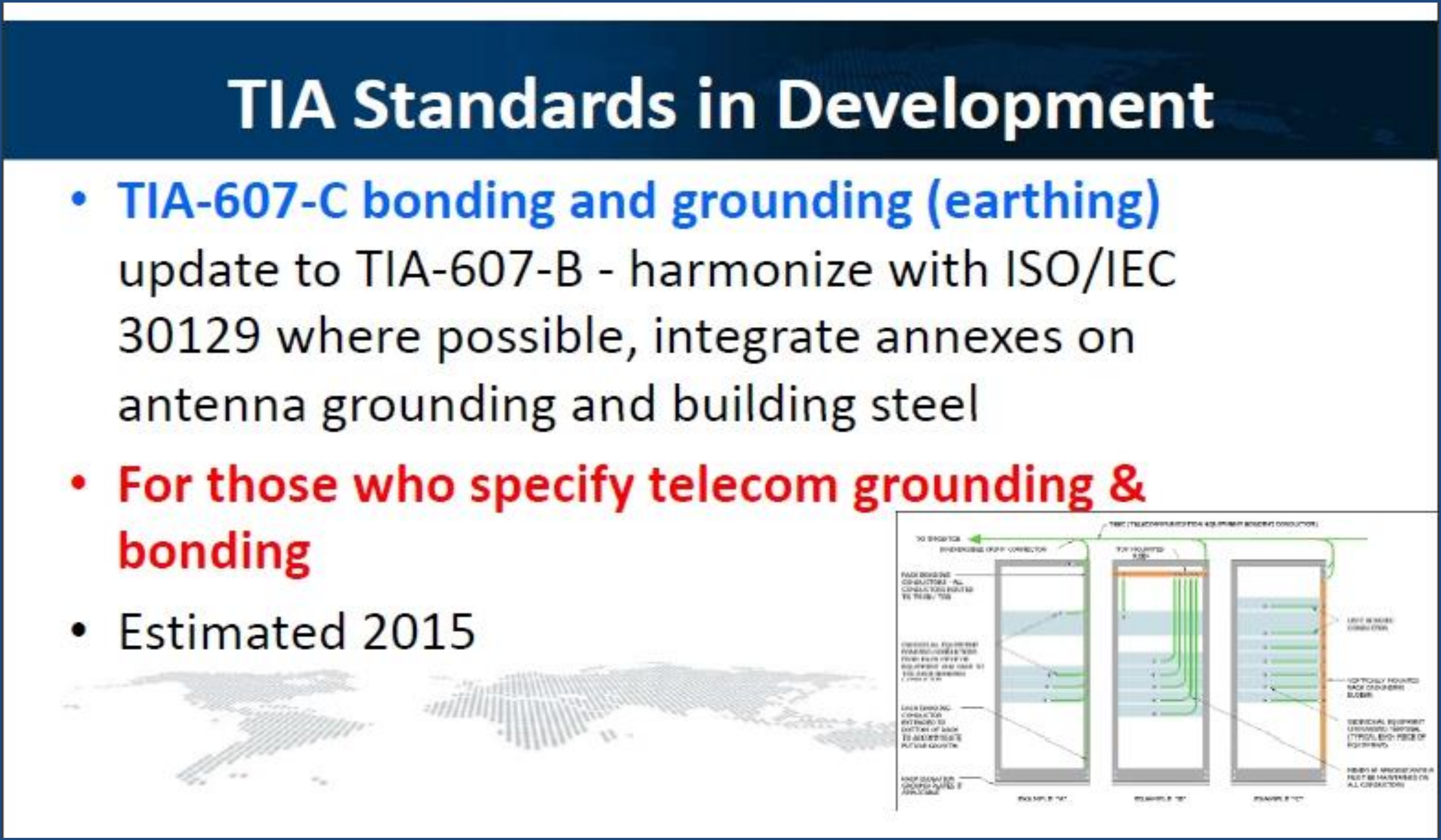
- **3rd Edition of ISO/IEC 11801 series** & reorganization of related standards (-1 General, -2 Offices, -3 Industrial, -4 Homes, -5 Data Centres) estimated publication 2016 – no more Cat 3, OM1, OM2. **For those who use ISO/IEC standards**
- **ISO/IEC 30129 – Telecommunications Bonding** - New standard based on ANSI/TIA-607-B and CENELEC EN 50310 - estimated 2015-2016 - **For those who specify telecom bonding & grounding**

Noted standards activity - 3

TIA – Published in 2013 & 2014

- **ANSI/TIA-607-B-2 – Structural Metal Addendum**
  - Harmonizes with ISO/IEC 30129 Telecom Bonding standard in development
  - Permits the use of an electrically continuous **building structural metal frame to be used in place of a dedicated telecommunications bonding backbone**
  - **For those who design or specify telecom bonding**

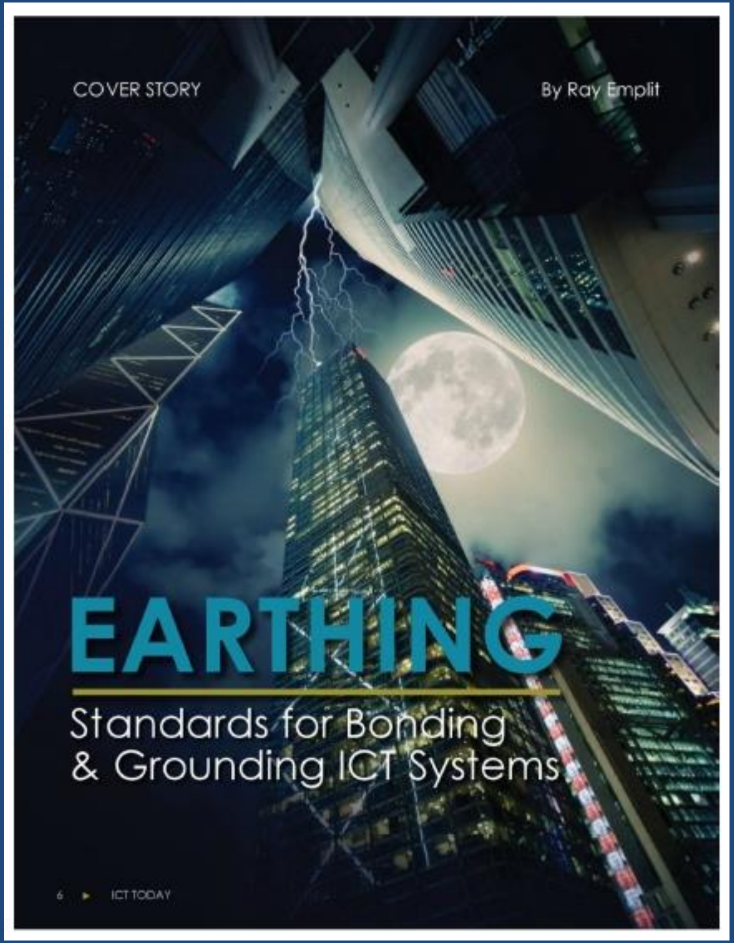
Noted standards activity - 4



TIA Standards in Development

- **TIA-607-C bonding and grounding (earthing)** update to TIA-607-B - harmonize with ISO/IEC 30129 where possible, integrate annexes on antenna grounding and building steel
- **For those who specify telecom grounding & bonding**
- Estimated 2015

BICSI’s *ICT* Article on Standards for Bonding & Grounding ICT Systems (Nov/DEC 2014)



COVER STORY

By Ray Emplit

EARTHING

Standards for Bonding & Grounding ICT Systems

6 ▸ ICT TODAY

COVER STORY

By Ray Emplit

EARTHING

Standards for Bonding & Grounding ICT Systems

ICT TODAY

- Good summary article on evolution of TIA 607 into TIA 607-C
- Input of TIA 607-B materials into IEC 30129
- Harmonization of TIA 607-C with IEC 30129
- Separate file – onscreen quick look

TIA 607 Diagram

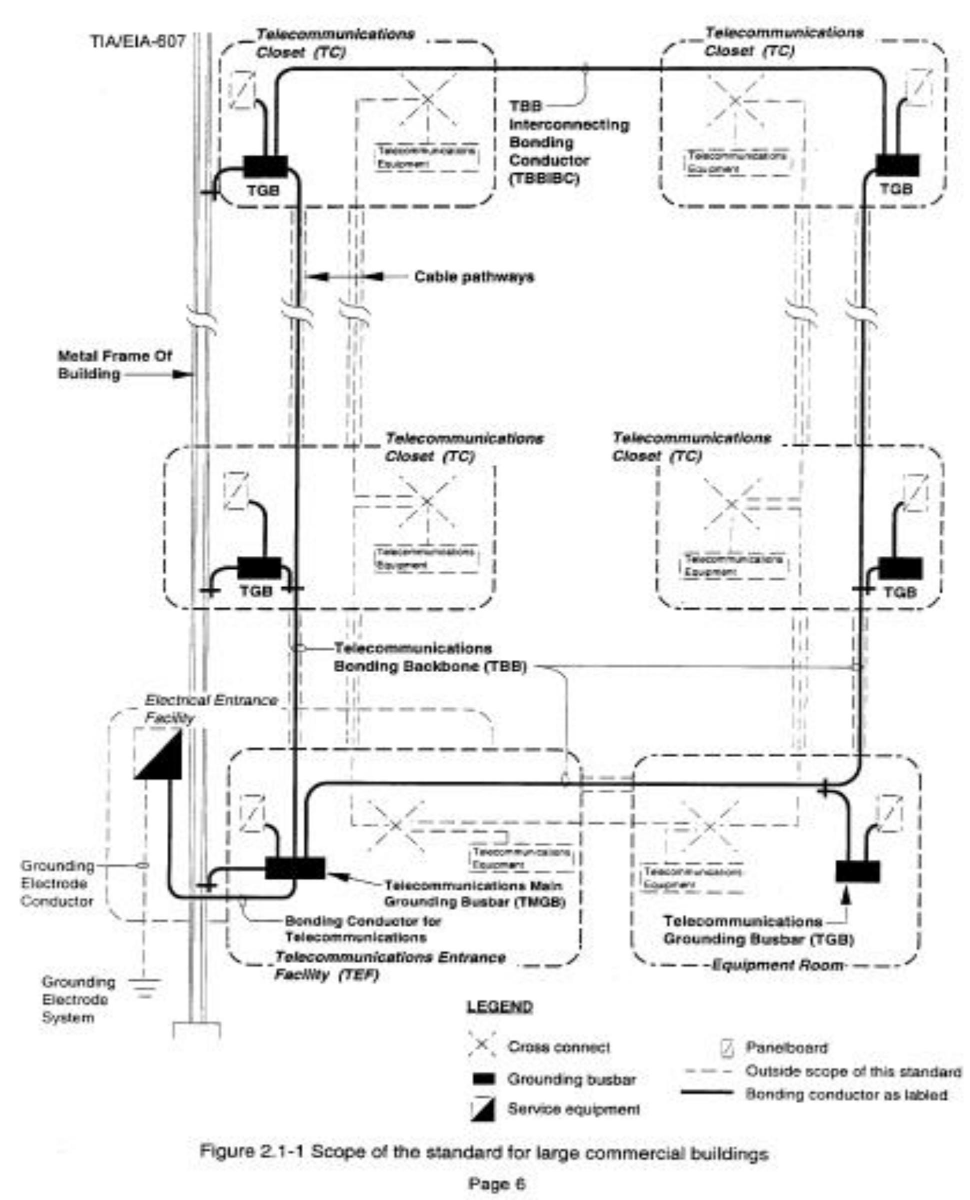


Figure 2.1-1 Scope of the standard for large commercial buildings

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TIA 607-A Diagram

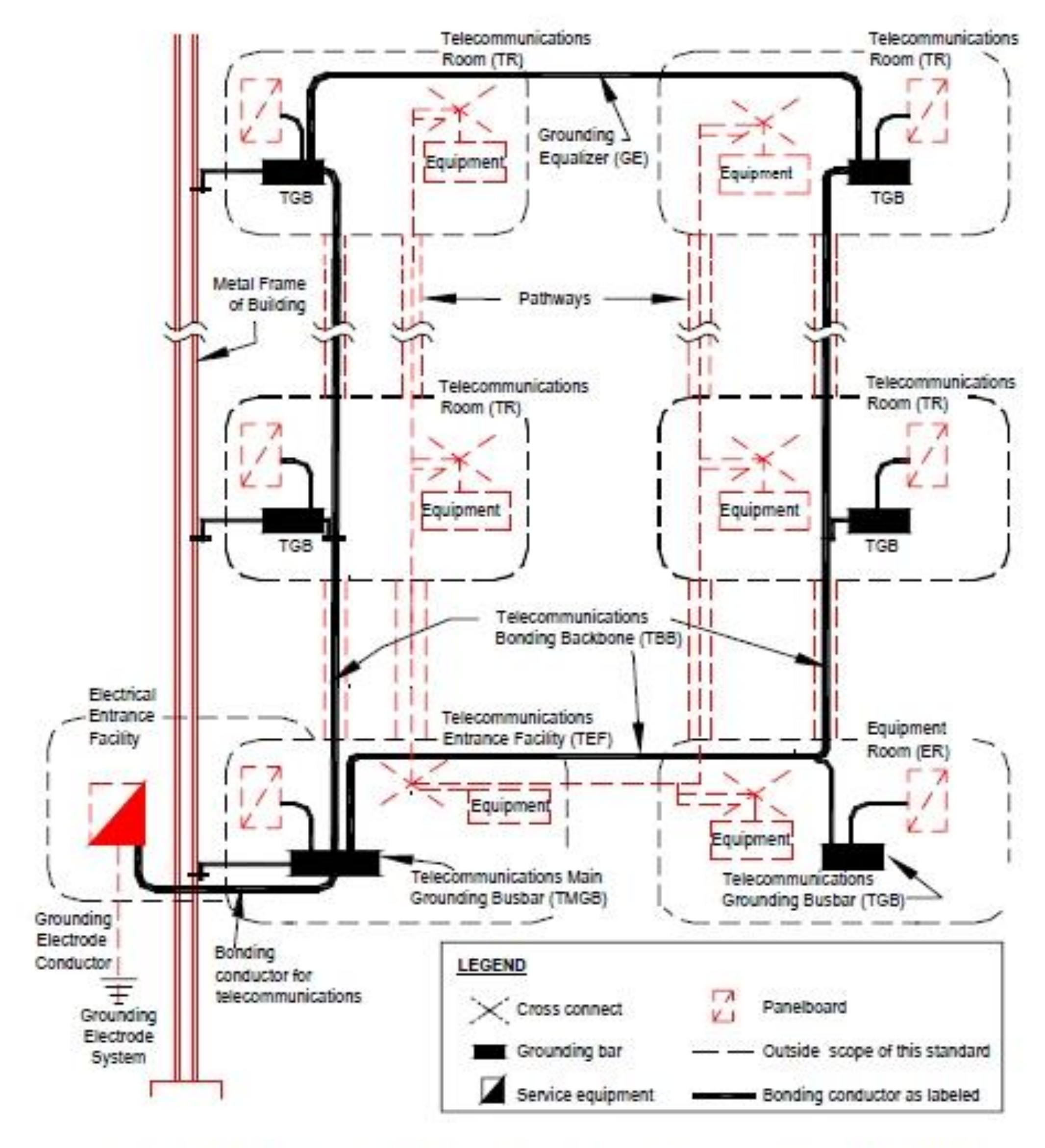


Figure 2.1-1 Scope of the standard for large commercial buildings

TIA 607-B Diagram

ANSI/TIA-607-B

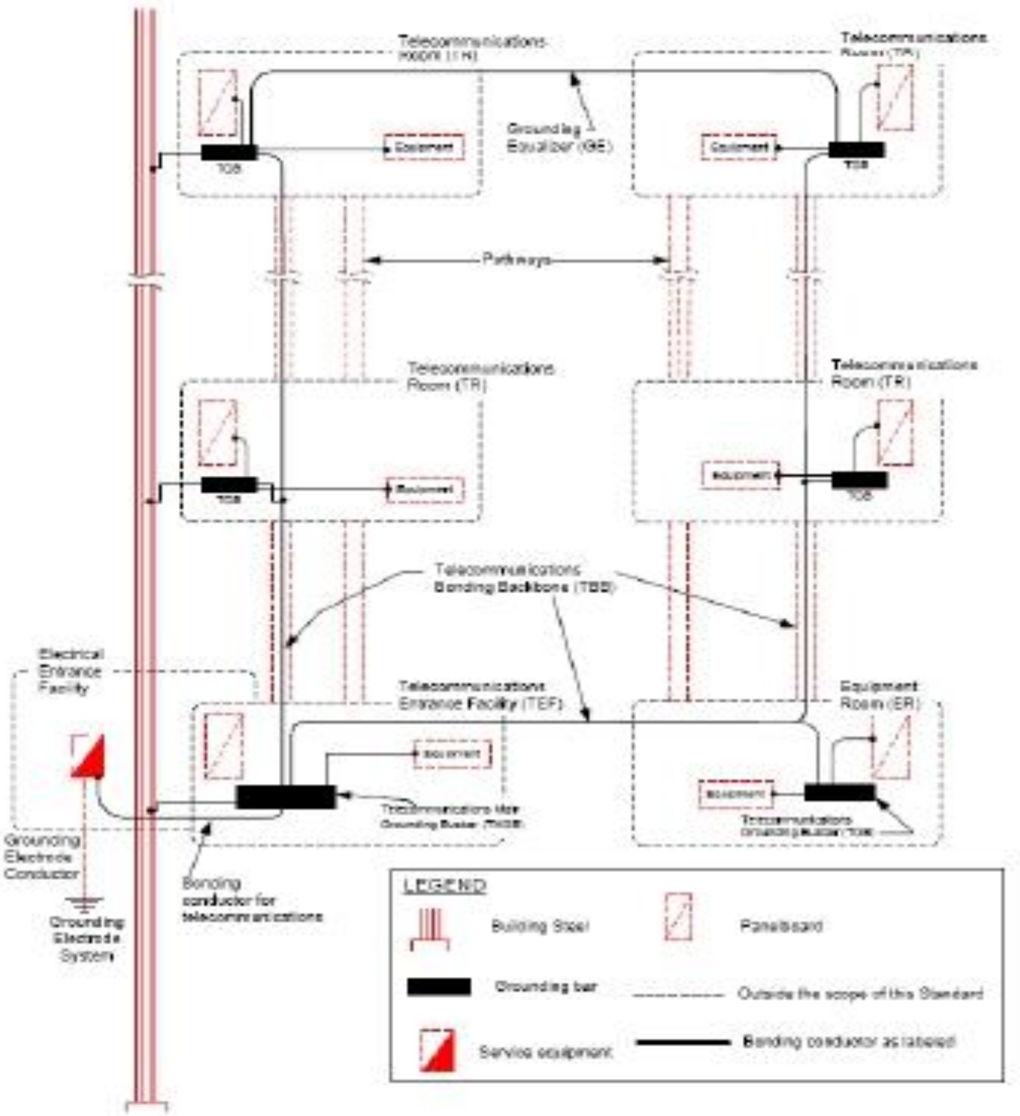
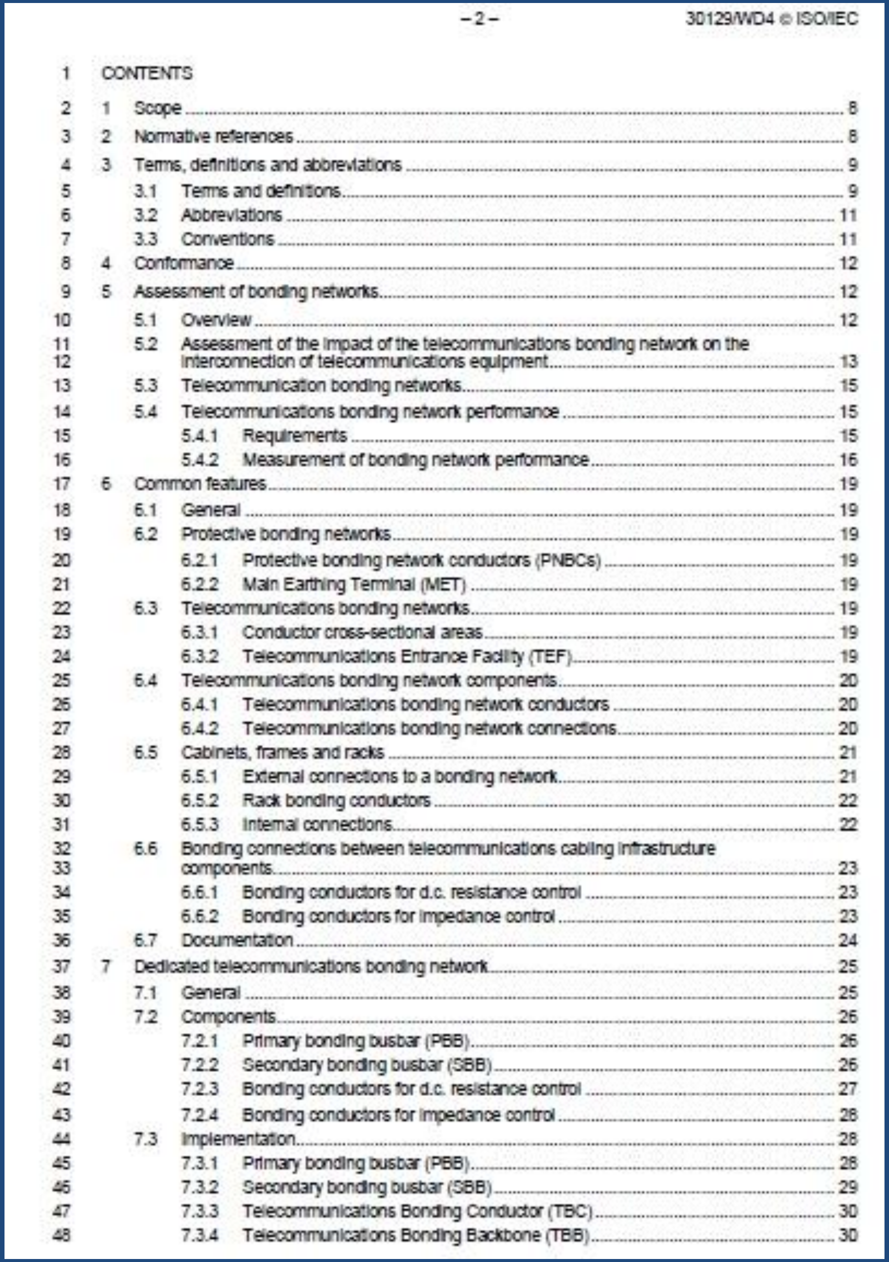


Figure 2 – Illustrative example of a larger building

IEC 30129 draft - Scope



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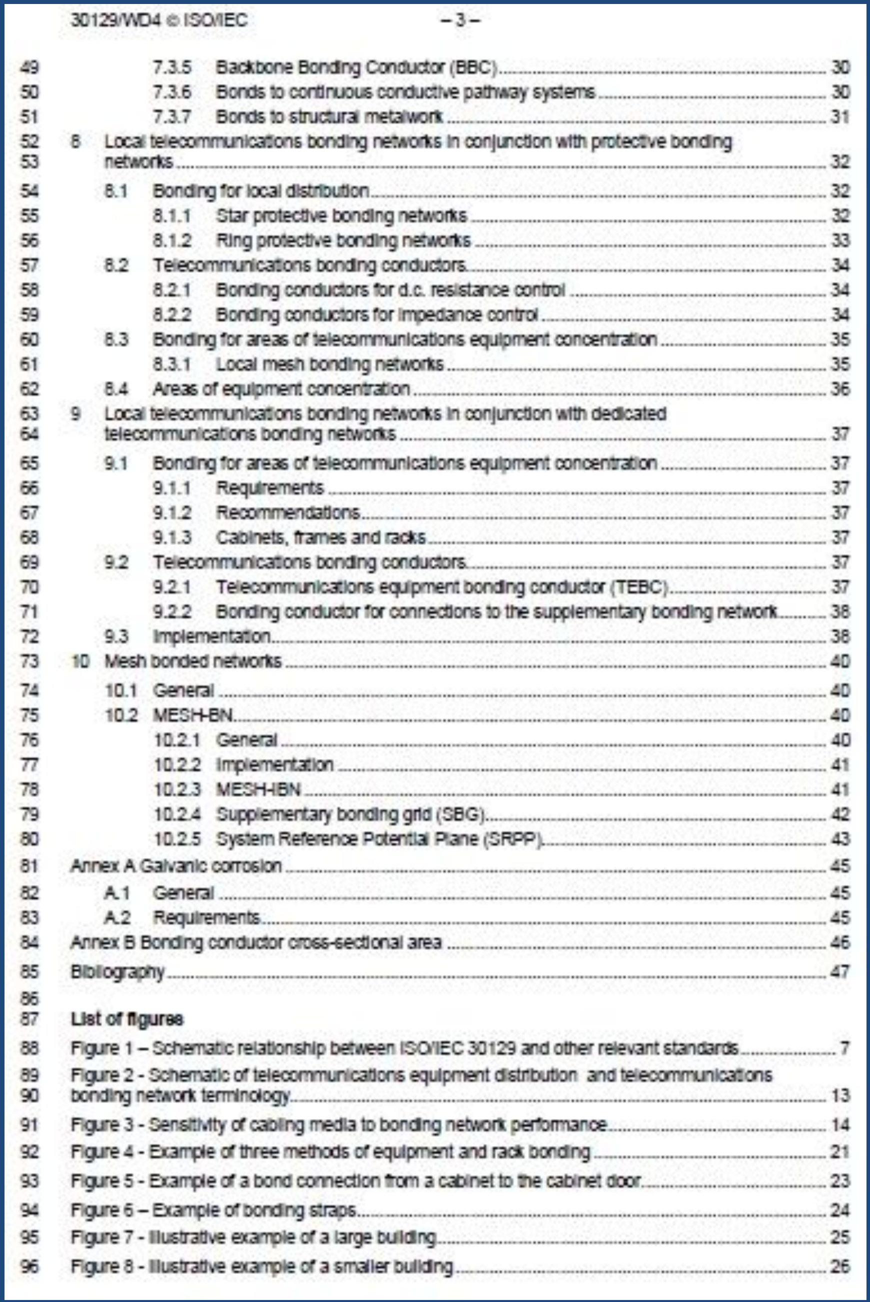
IEC 30129 draft - Scope



List of figures

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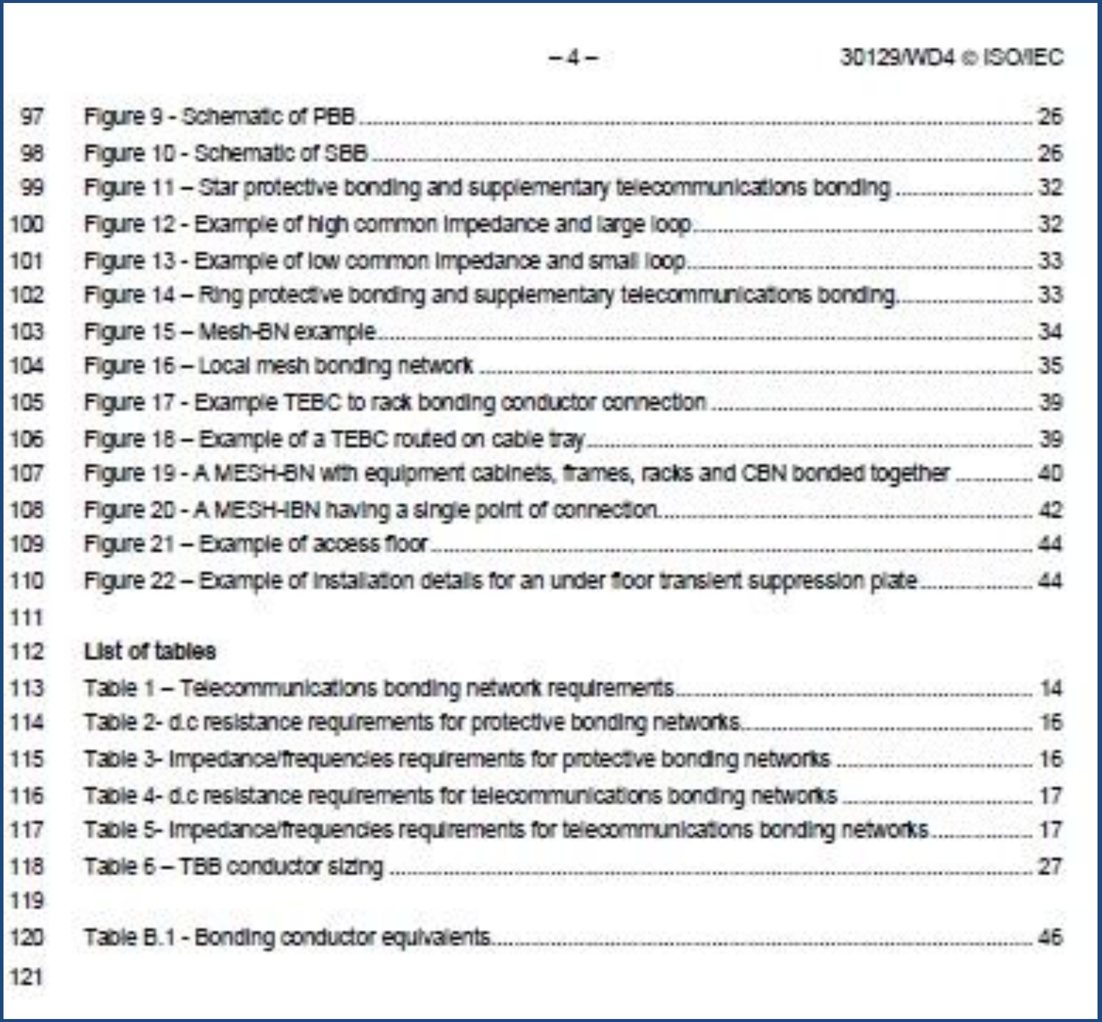
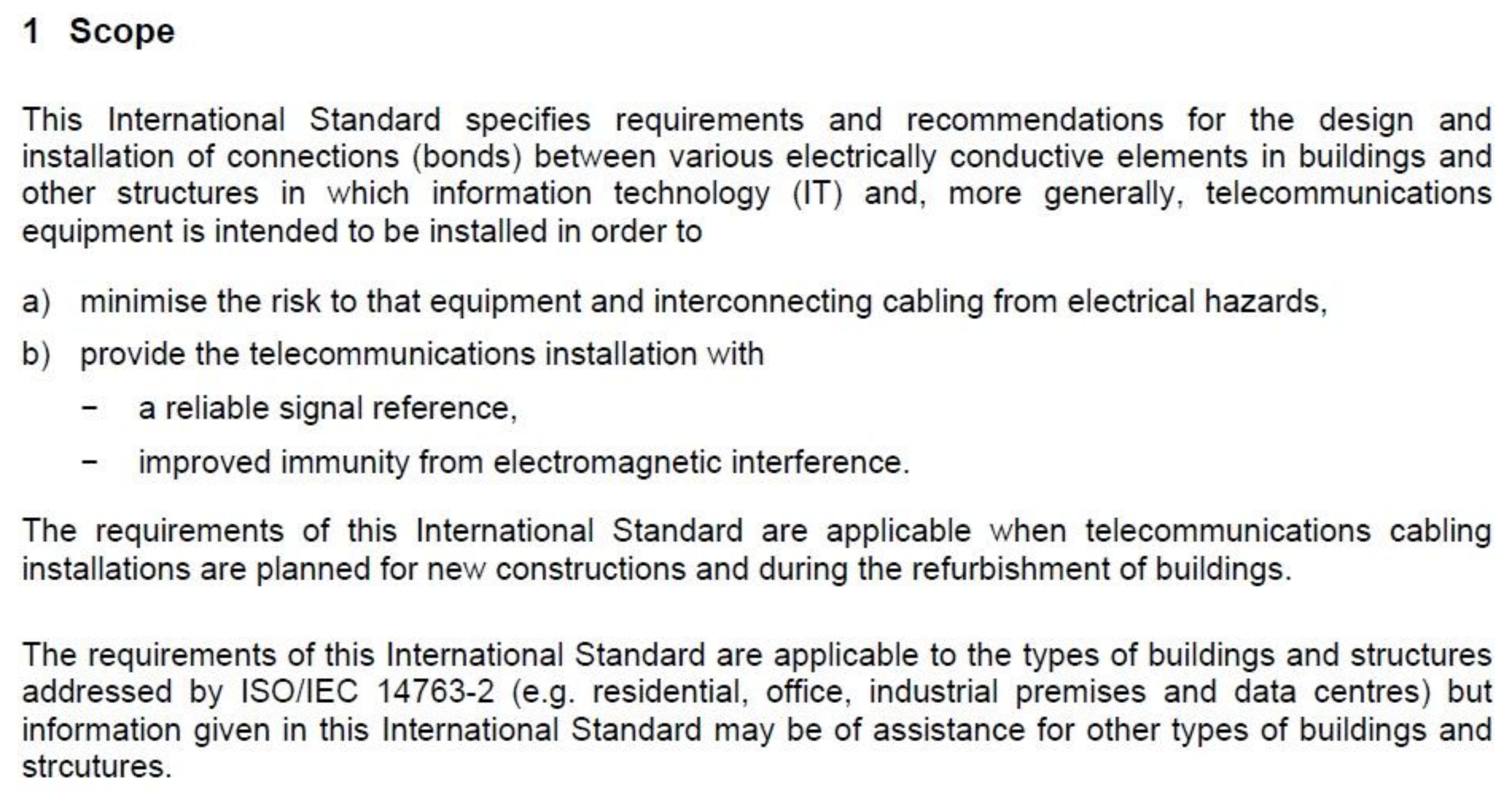


List of tables

IEC 30129 draft - Scope



1 Scope

This International Standard specifies requirements and recommendations for the design and installation of connections (bonds) between various electrically conductive elements in buildings and other structures in which information technology (IT) and, more generally, telecommunications equipment is intended to be installed in order to

a) minimise the risk to that equipment and interconnecting cabling from electrical hazards,

b) provide the telecommunications installation with

- a reliable signal reference,
- improved immunity from electromagnetic interference.

The requirements of this International Standard are applicable when telecommunications cabling installations are planned for new constructions and during the refurbishment of buildings.

The requirements of this International Standard are applicable to the types of buildings and structures addressed by ISO/IEC 14763-2 (e.g. residential, office, industrial premises and data centres) but information given in this International Standard may be of assistance for other types of buildings and strcutures.

IEC 30129 draft – Figure 2

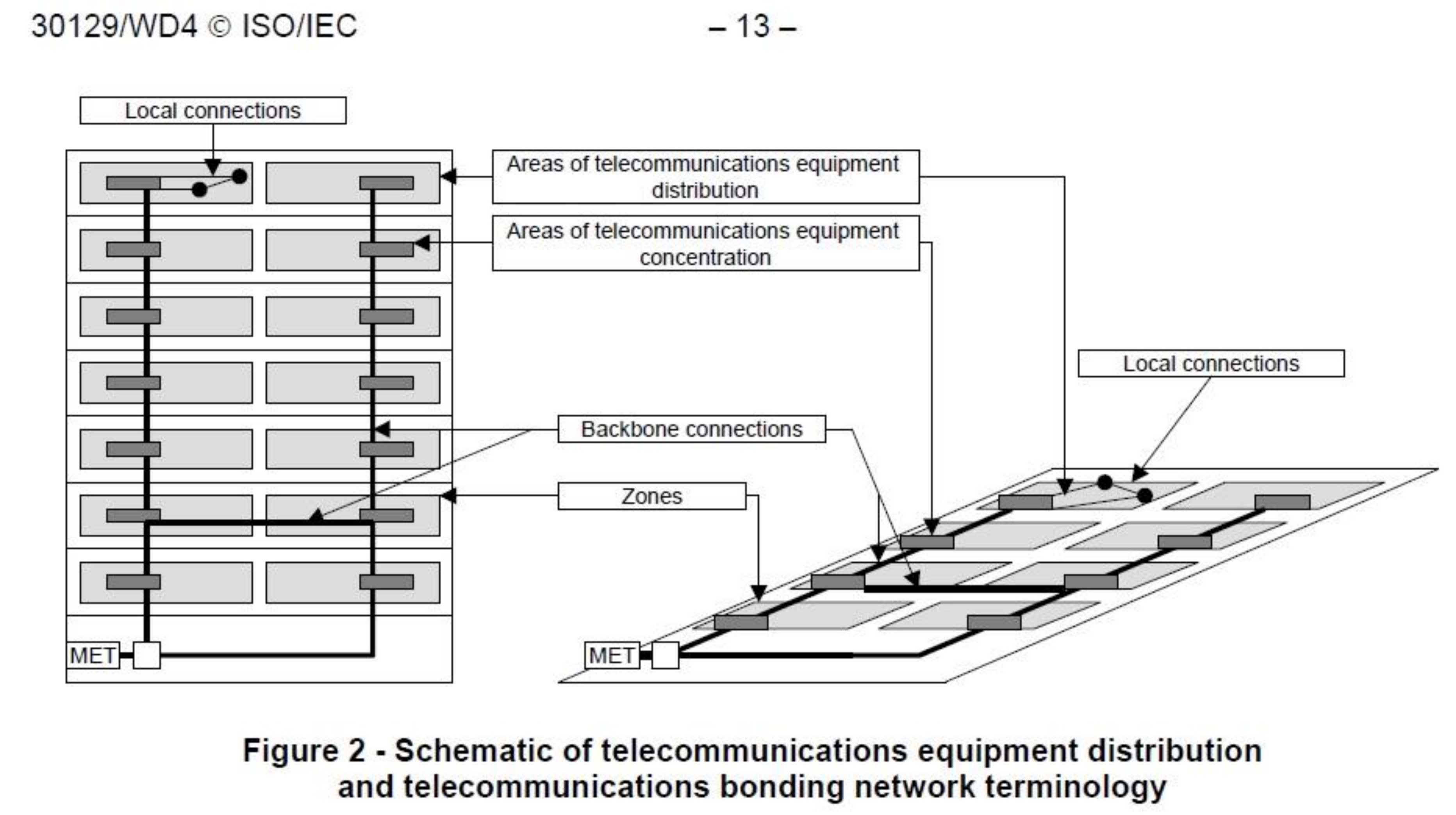

30129/WD4 © ISO/IEC – 13 –

Figure 2 - Schematic of telecommunications equipment distribution and telecommunications bonding network terminology

IEC 30129 draft – Table 1

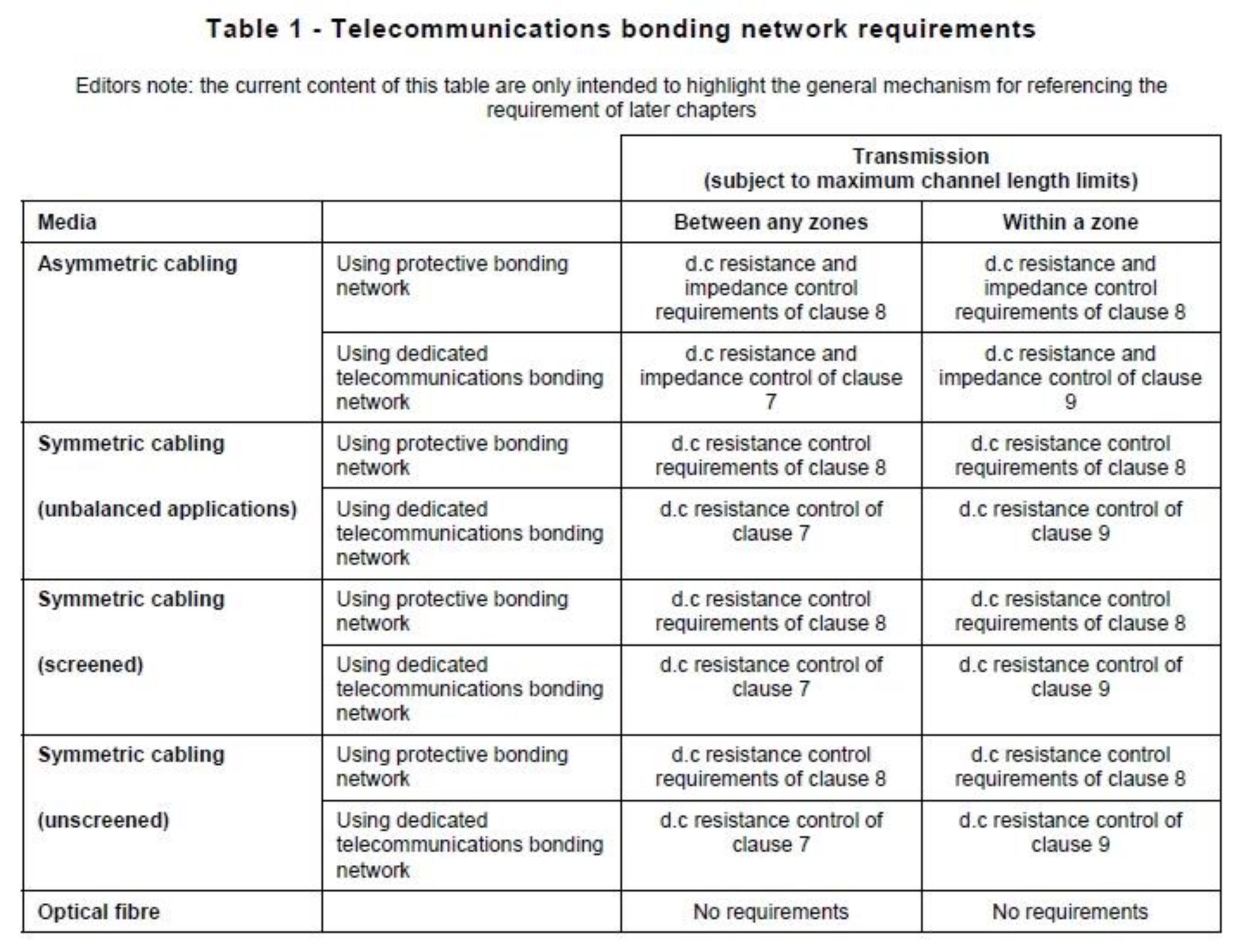


Table 1 - Telecommunications bonding network requirements

Editors note: the current content of this table are only intended to highlight the general mechanism for referencing the requirement of later chapters

		Transmission (subject to maximum channel length limits)	
Media		**Between any zones**	**Within a zone**
Asymmetric cabling	Using protective bonding network	d.c resistance and impedance control requirements of clause 8	d.c resistance and impedance control requirements of clause 8
	Using dedicated telecommunications bonding network	d.c resistance and impedance control of clause 7	d.c resistance and impedance control of clause 9
Symmetric cabling (unbalanced applications)	Using protective bonding network	d.c resistance control requirements of clause 8	d.c resistance control requirements of clause 8
	Using dedicated telecommunications bonding network	d.c resistance control of clause 7	d.c resistance control of clause 9
Symmetric cabling (screened)	Using protective bonding network	d.c resistance control requirements of clause 8	d.c resistance control requirements of clause 8
	Using dedicated telecommunications bonding network	d.c resistance control of clause 7	d.c resistance control of clause 9
Symmetric cabling (unscreened)	Using protective bonding network	d.c resistance control requirements of clause 8	d.c resistance control requirements of clause 8
	Using dedicated telecommunications bonding network	d.c resistance control of clause 7	d.c resistance control of clause 9
Optical fibre		No requirements	No requirements

IEC 30129 draft – Figure 4

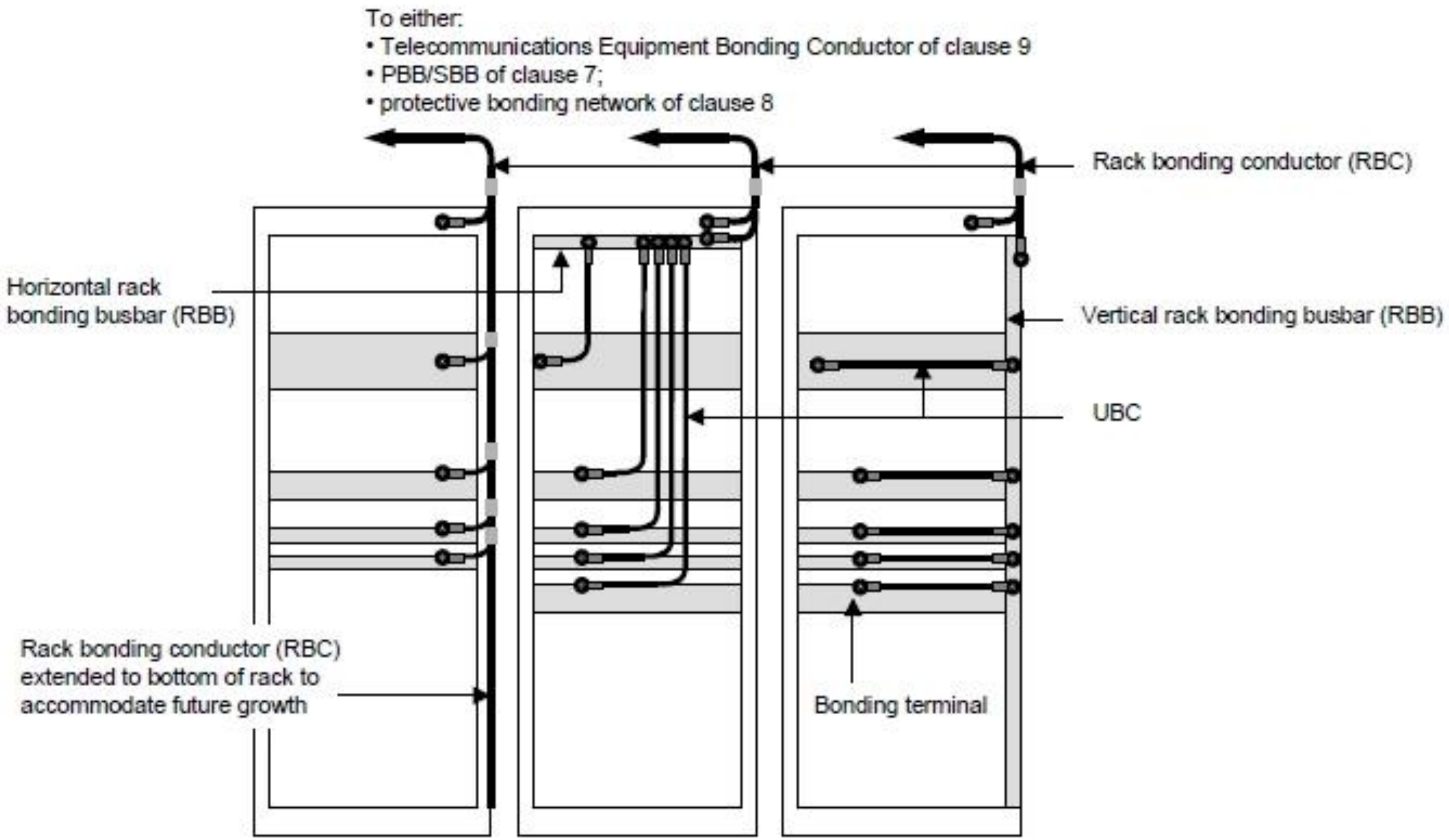


Figure 4 - Example of three methods of equipment and rack bonding

IEC 30129 draft – Figure 7

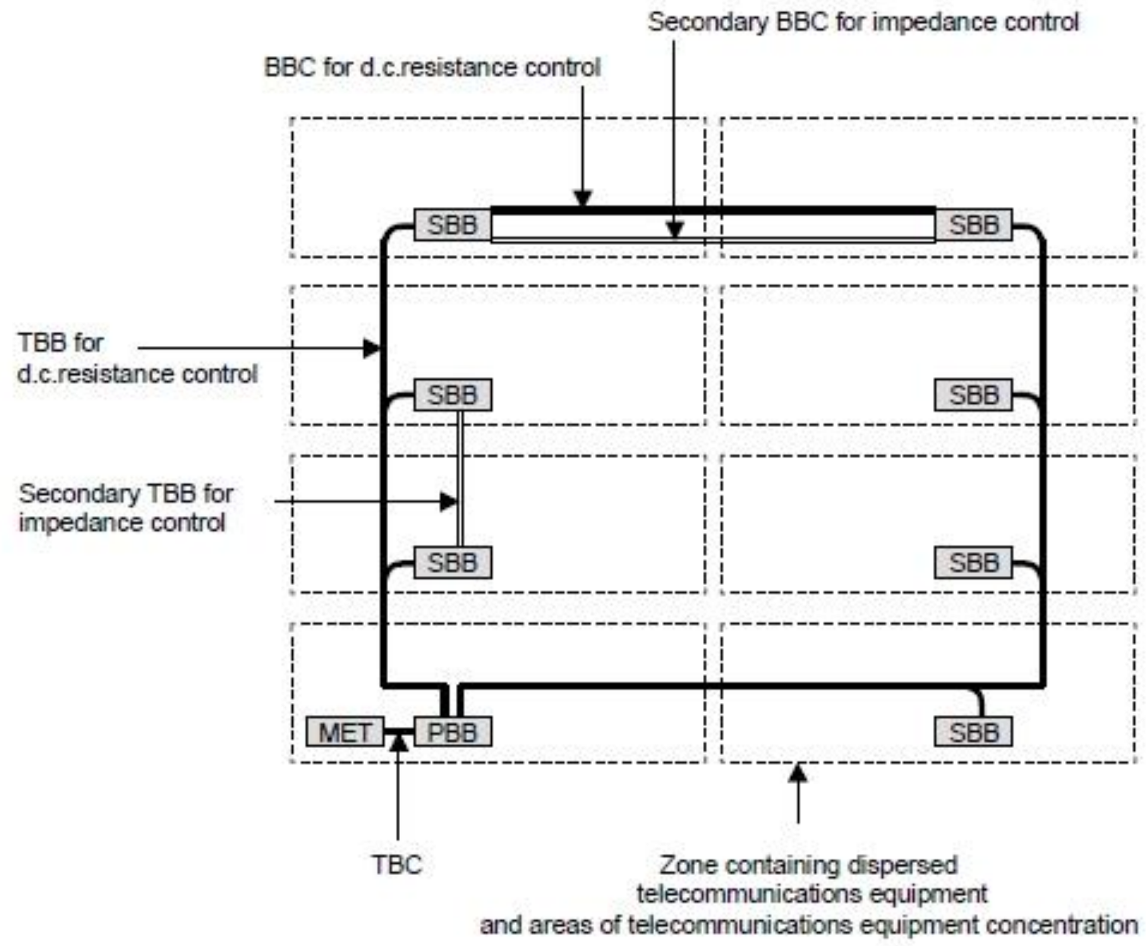
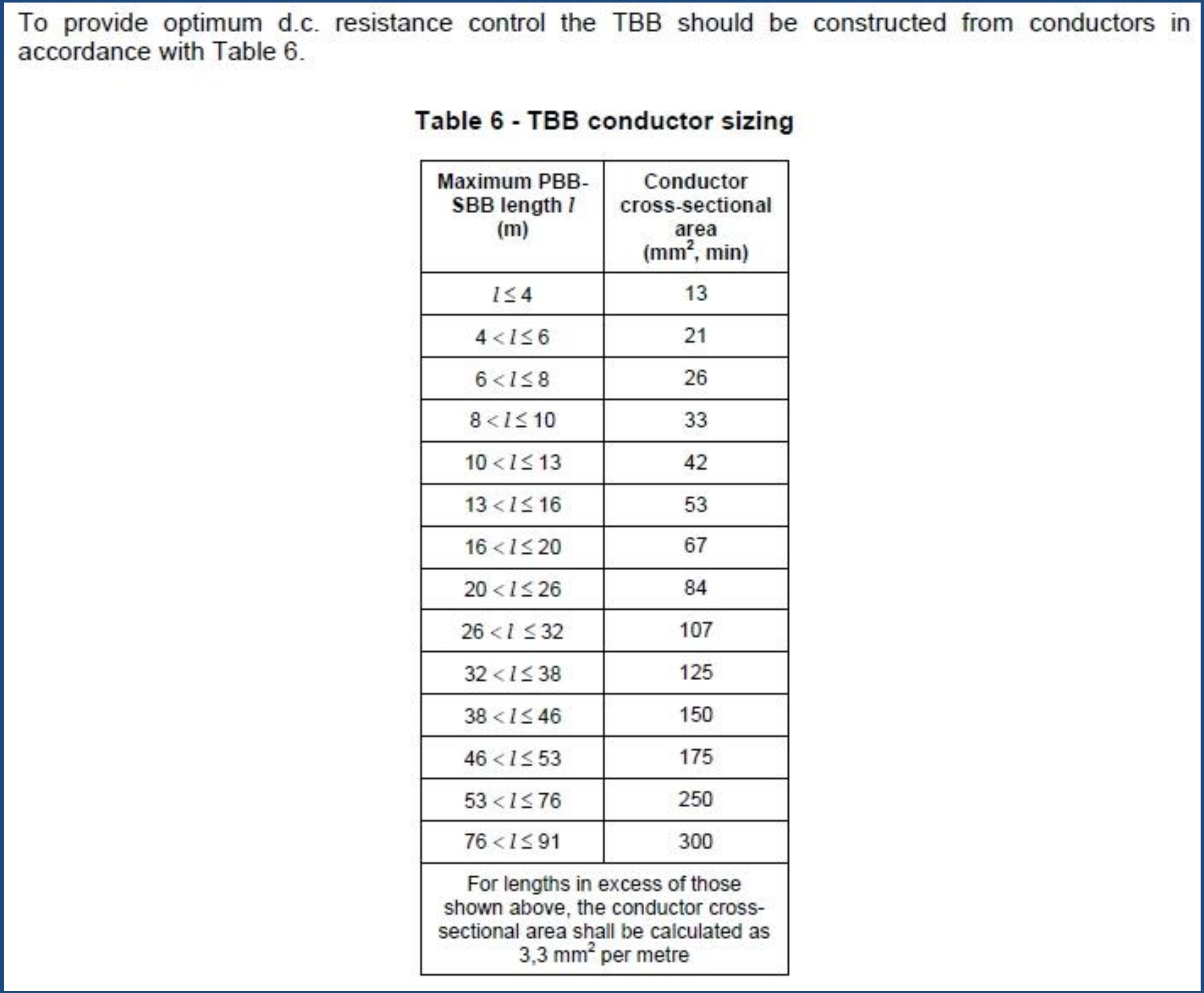


Figure 7 - Illustrative example of a large building

IEC 30129 draft – Figure 7



To provide optimum d.c. resistance control the TBB should be constructed from conductors in accordance with Table 6.

Table 6 - TBB conductor sizing

Maximum PBB-SBB length l (m)	Conductor cross-sectional area (mm^2, min)
$l \le 4$	13
$4 < l \le 6$	21
$6 < l \le 8$	26
$8 < l \le 10$	33
$10 < l \le 13$	42
$13 < l \le 16$	53
$16 < l \le 20$	67
$20 < l \le 26$	84
$26 < l \le 32$	107
$32 < l \le 38$	125
$38 < l \le 46$	150
$46 < l \le 53$	175
$53 < l \le 76$	250
$76 < l \le 91$	300
For lengths in excess of those shown above, the conductor cross-sectional area shall be calculated as 3,3 mm^2 per metre	

IEC 30129 draft – Figure 15

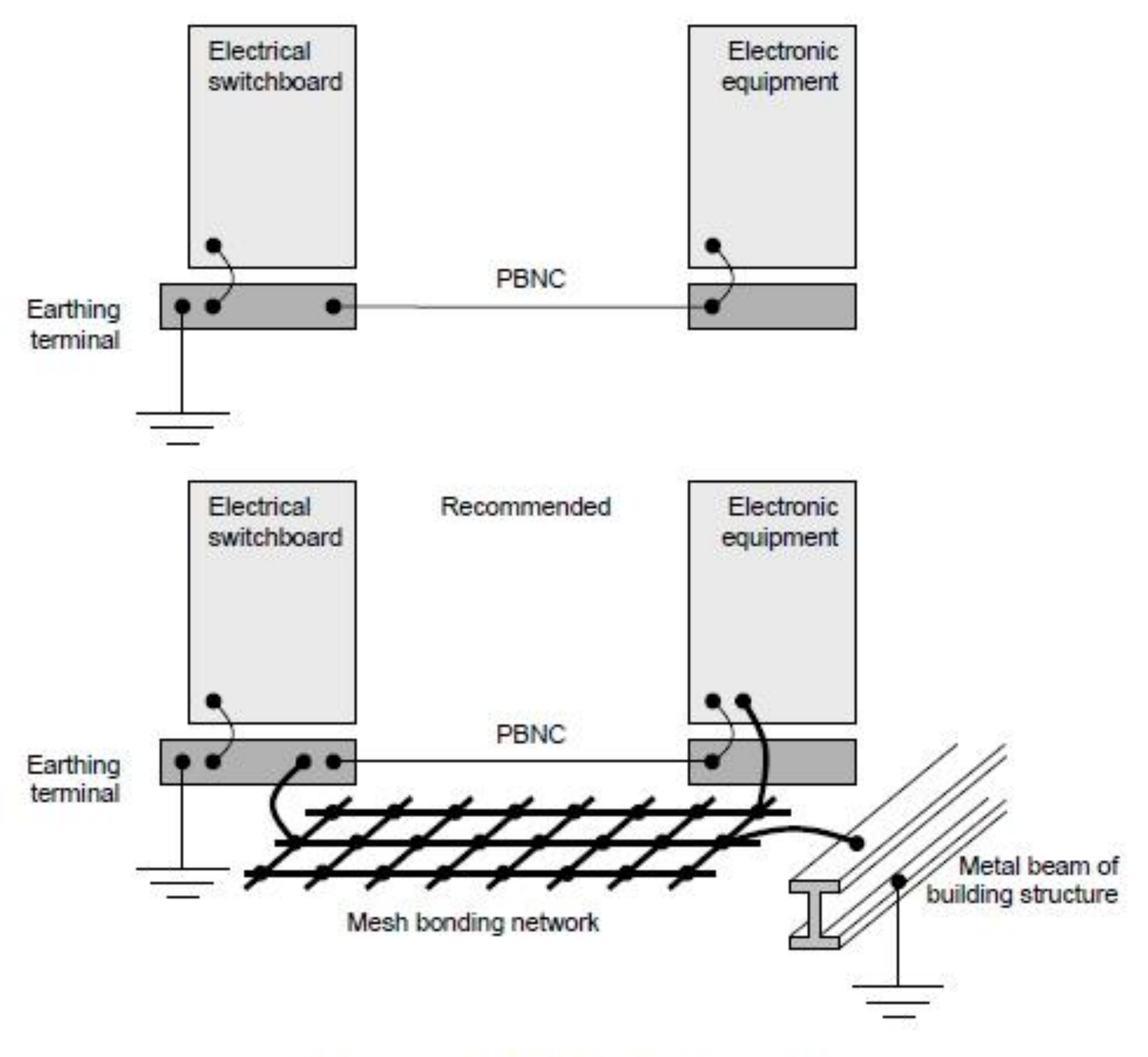
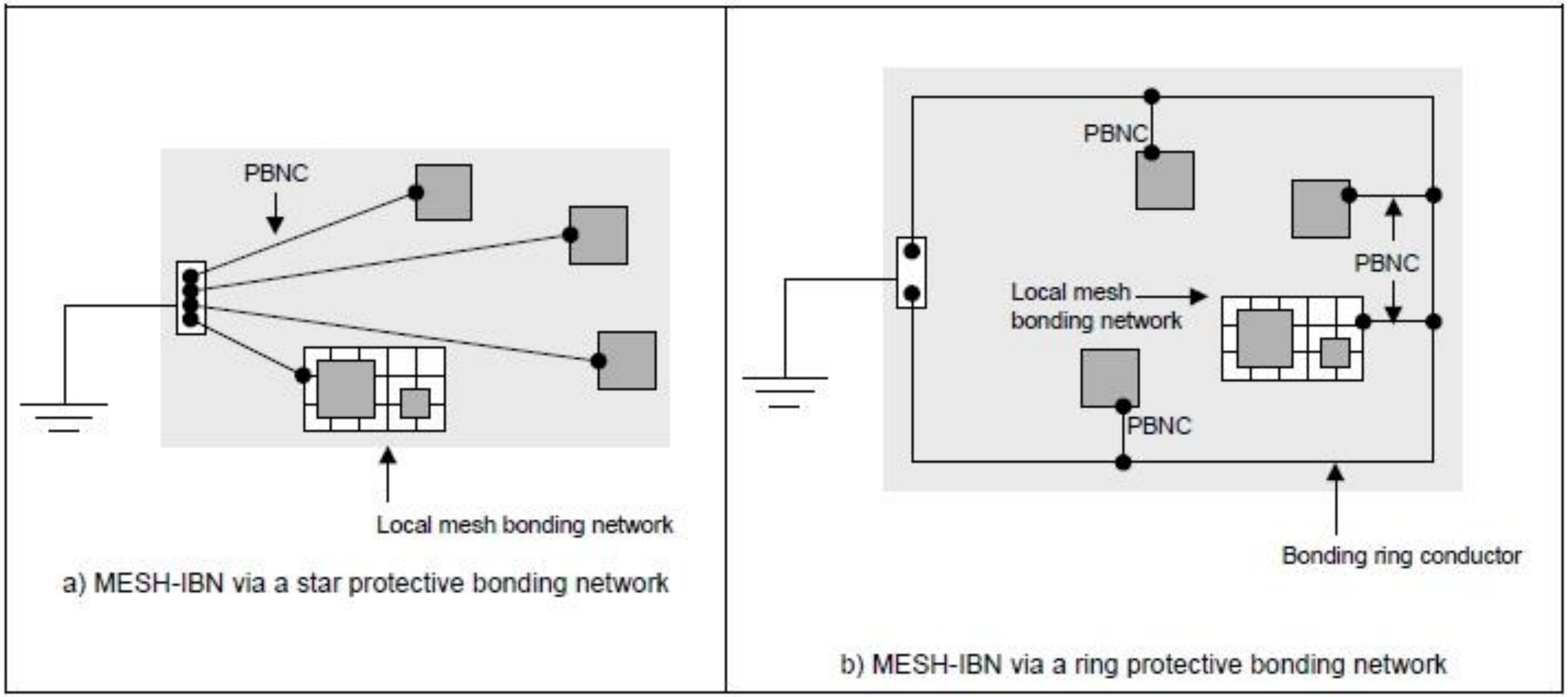


Figure 15 - Mesh-BN example

IEC 30129 draft – Figure 16



a) MESH-IBN via a star protective bonding network

b) MESH-IBN via a ring protective bonding network

Figure 16 - Local mesh bonding network

IEC 30129 draft – Figure 16

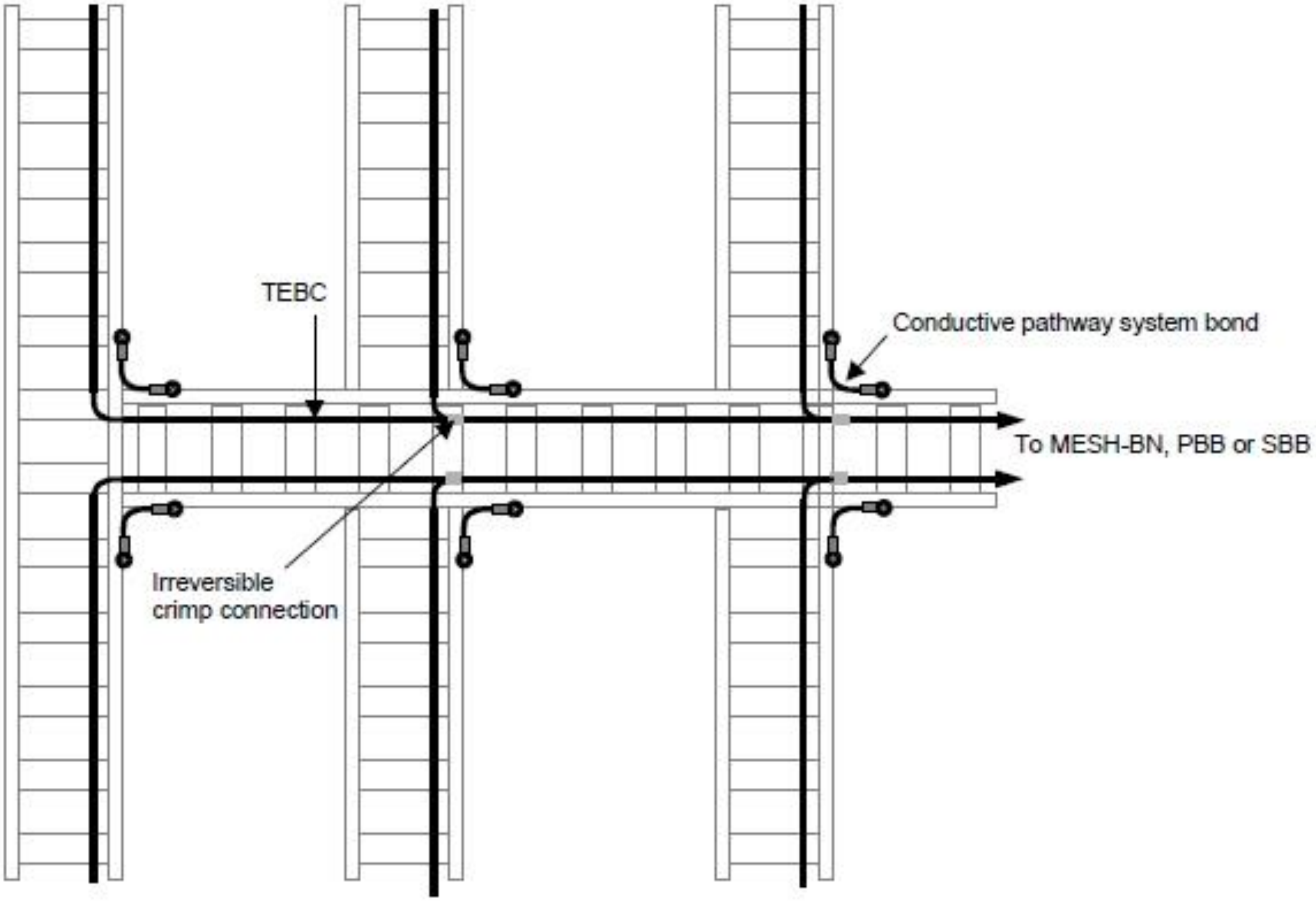


Figure 18 - Example of a TEBC routed on cable tray

IEC 30129 draft – Figure 19

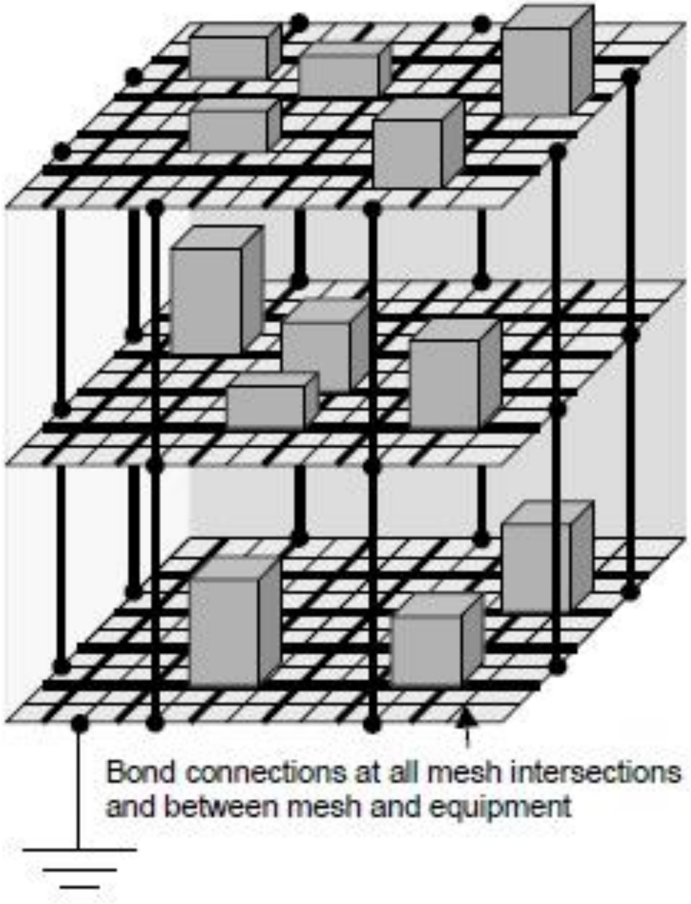


Figure 19 - A MESH-BN with equipment cabinets, frames, racks and CBN bonded together

IEC 30129 draft – Figure 19

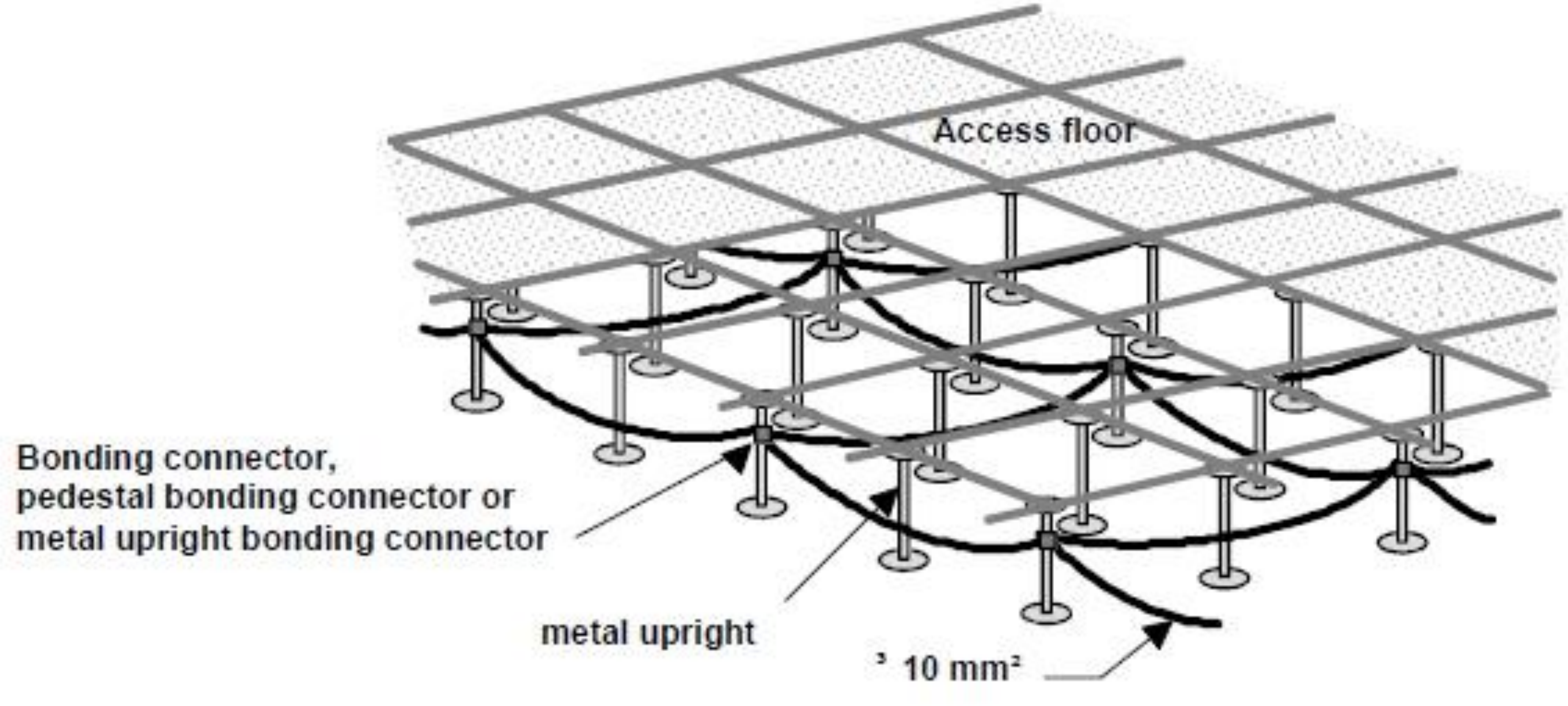


Figure 21 - Example of access floor

Recognized Problems

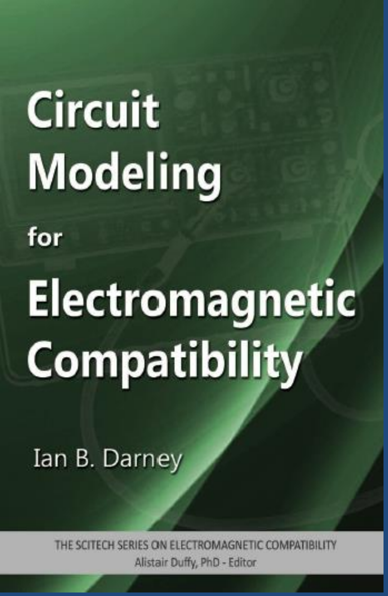
- Lingering myths of grounding & bonding
- WGs driven by marketing interests
- Migration of trade std to Int’l std status
- Commercial building is baseline layout

Lingering myths of grounding & bonding

- AC power faults require TBB to be "engineered" as an ac equip grd conductor
  - Also, TBB sized at 2 kcmil/ft (GTE Labs artifact)

- ITE requires increasingly stringent grounding
  - Bigger and/or more wires; "bonding grids"

- Grounding/bonding cures all ITE "ghost" operational problems

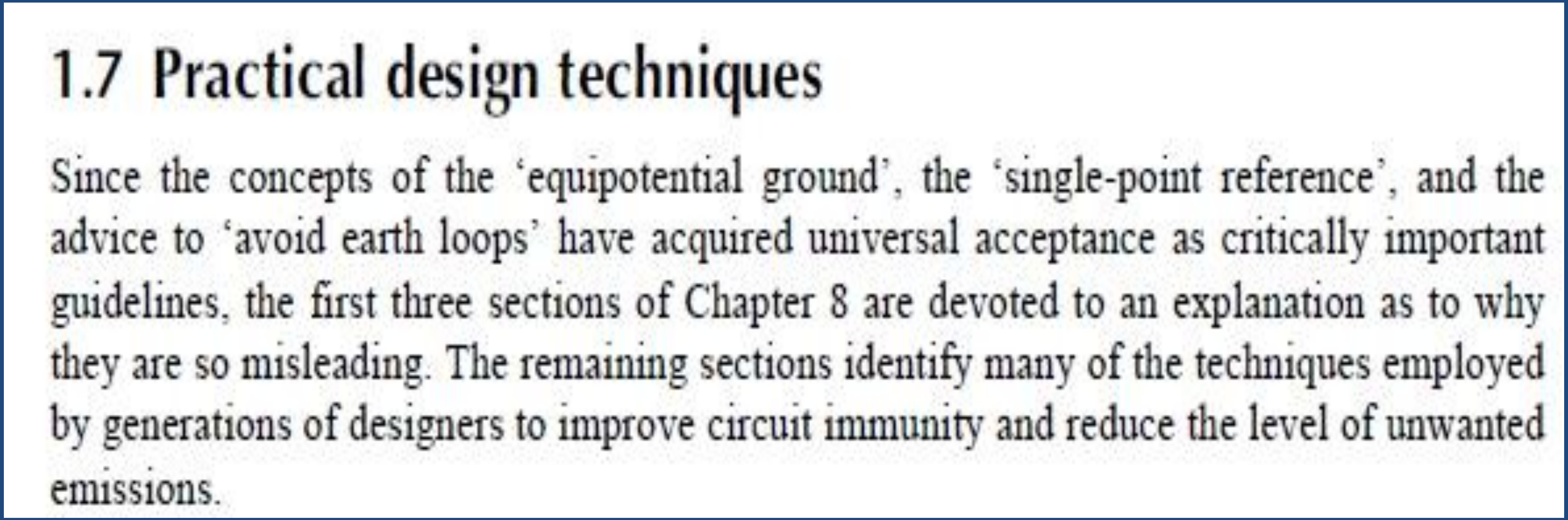


Circuit
Modeling
for
Electromagnetic
Compatibility

Ian B. Darney

THE SCITECH SERIES ON ELECTROMAGNETIC COMPATIBILITY
Alistair Duffy, PhD - Editor

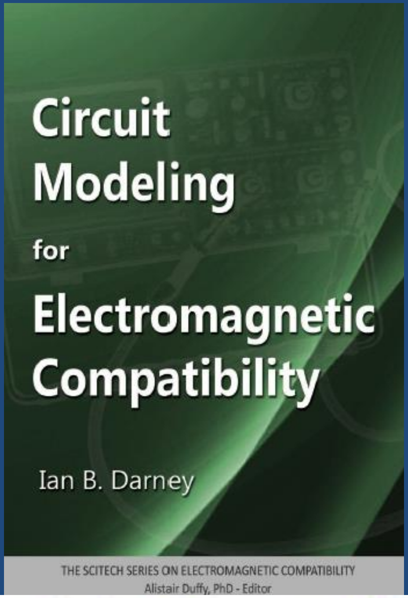
Grounding & Bonding Industry Recognized as Misleading

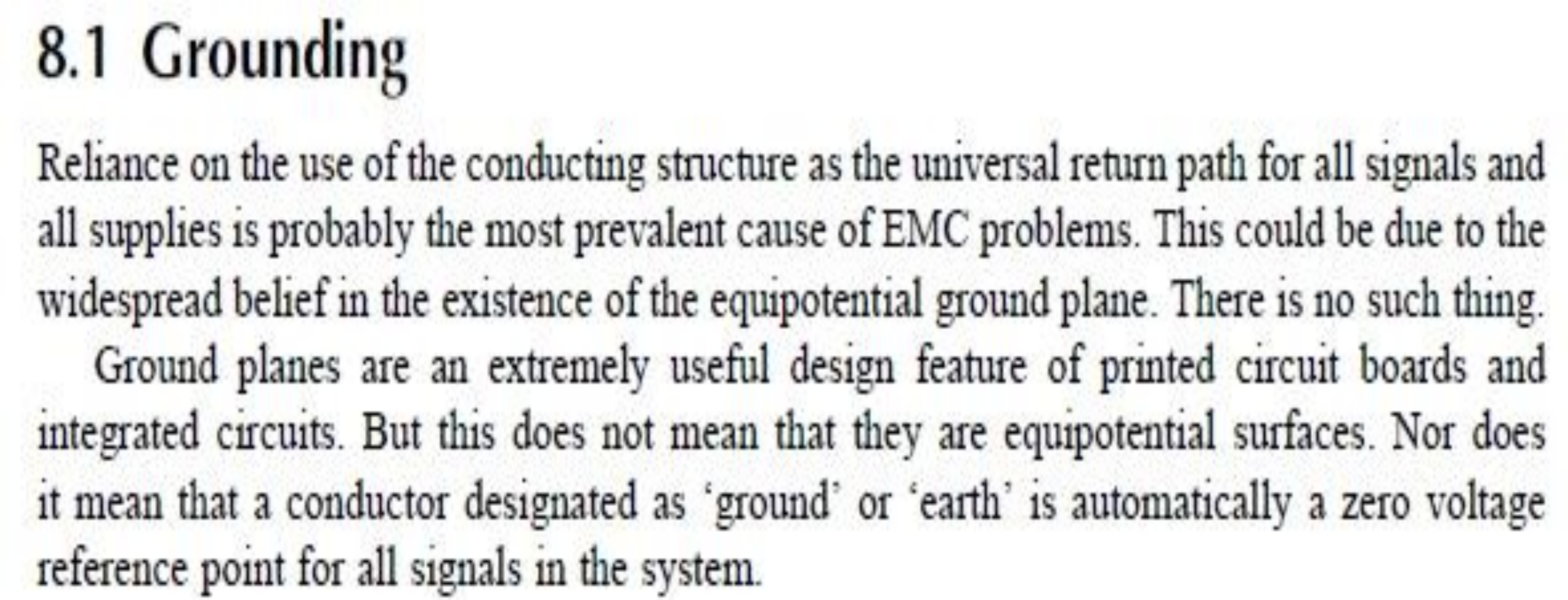


1.7 Practical design techniques

Since the concepts of the 'equipotential ground', the 'single-point reference', and the advice to 'avoid earth loops' have acquired universal acceptance as critically important guidelines, the first three sections of Chapter 8 are devoted to an explanation as to why they are so misleading. The remaining sections identify many of the techniques employed by generations of designers to improve circuit immunity and reduce the level of unwanted emissions.

Grounding & Bonding Industry Recognized as Misleading





8.1 Grounding

Reliance on the use of the conducting structure as the universal return path for all signals and all supplies is probably the most prevalent cause of EMC problems. This could be due to the widespread belief in the existence of the equipotential ground plane. There is no such thing.

Ground planes are an extremely useful design feature of printed circuit boards and integrated circuits. But this does not mean that they are equipotential surfaces. Nor does it mean that a conductor designated as 'ground' or 'earth' is automatically a zero voltage reference point for all signals in the system.